

Common Diseases & Parasites of Cottontails

Disease or parasite	Where found	Appearance	Quality of meat
Tularemia	Liver, spleen	Many tiny white specks, liver may appear to be swollen or puffy.	Unsafe to handle, unfit to eat.
Bladderworms (dog tape worm)	On surfaces of liver, intestines, etc.	Clear, jelly-like bladders up to ¼" diameter, with milky center.	Safe
Rabbit Tape Worm	Intestines, or free within body cavity	Segmented white ribbon, ¼" wide.	Safe
Rabbit Grub	Pocket in skin on neck, back, or sides	Dark grub, 1" long, ½" diameter.	Safe
Fibroma	Head, ears, feet	Hairless warts attached to skin light or dark colored, round or spindle-shaped.	Safe
Sarcocystis	Muscles	Whitish, thread-like cysts oriented parallel to muscle fibers.	(See Text)

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Cover by C. W. Schwartz

Introduction

Although the vast majority of Missouri cottontails are healthy and pose no threat to hunters or trappers, many rabbits are discarded each year when confusion arises about the safe handling or the edibility of the day's harvest. Some very common and harmless conditions are confused with the symptoms of tularemia, or "rabbit fever", and this can lead to some anxious moments or discarded rabbits, or both.

The purpose of this publication is to provide a brief discussion of some of the diseases and parasites commonly encountered in Missouri cottontails, including tularemia. We hope, perhaps, that hunters and others who clean cottontails will become better able to distinguish the symptoms of tularemia, which makes rabbits inedible and unsafe to handle, from the many other conditions that have no affect on human use of cottontails for sport and food.

Tularemia

Tularemia is a bacterial disease that has been reported in more than 80 species of mammals, including rabbits and humans. It is a potentially serious disease if untreated, however, early diagnosis and treatment can markedly reduce the severity of the infection.

The disease is transmitted to humans in a variety of ways. Blenden (1981) examined Missouri Division of Health records for the 30-year period 1949 to 1979 and reported that the sources of contact were: unknown 57%, tick bites 26%, rabbits 13%, and others (squirrels, etc.) 3%. Thus, in those cases where contact was known tick bites accounted for about twice the number of reported infections in humans as did contact with rabbits. In addition to tick bites, the infective organism (*Francisella tularensis*) can be transmitted to humans through the bites of flies, lice, fleas, etc. Contaminated drinking water is also a known cause for the disease.

Blenden's report suggests that a significant shift in the important causes of tularemia may have occurred during recent years. Public health records from Illinois during the period 1926-1951, reported by Sharp (1939), McDaniels (1943), and Yeatter and Thompson (1952), show that virtually all cases of tularemia were traceable to contacts with cottontail rabbits. This has not been the case in Missouri during the past 3 decades. In view of this apparent shift in the sources of contact, two conclusions seem to be justified: (1) rabbits are still a possible source of tularemia, but (2) the threat to hunters may be somewhat less than previously thought.

But that's enough background information, let's get down to business—how do you recognize tularemia in rabbits; (1) before you shoot 'em, and (2) during the cleaning process?

There's no sure-fire way of recognizing a rabbit with tularemia before you shoot it; except that rabbits with tularemia are *sick* and they don't behave normally. This abnormal behavior can make them appear tame and unwary, or if they run...they appear to be awkward, stumbling, or weak. There are several other conditions that can cause the same signs and only tularemia constitutes a threat to

humans...but why take a chance? Rabbits that don't react normally, or are easily caught by hunting dogs, especially beagles, should be handled carefully, or not at all. If you insist on taking a chance, and you later develop chills and fever, plus swollen lymph glands be sure to mention that rabbit to your doctor! To be on the safe side, dispatch quickly any rabbit that appears to be sick, or moves awkwardly, and bury it or cover it with rocks. If the animal does have tularemia your actions will help minimize your exposure and that of others.

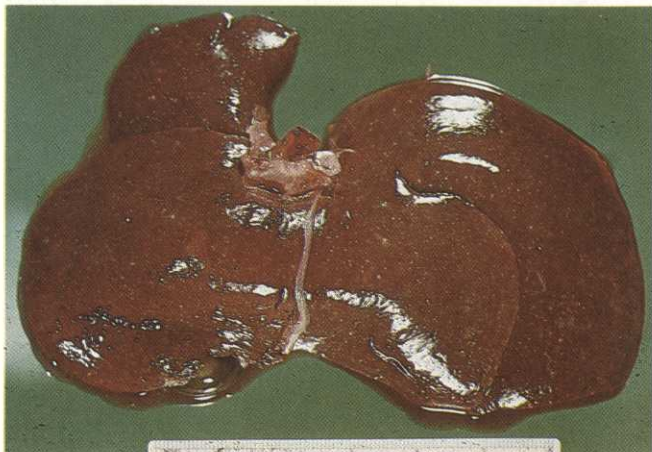


Figure 1. Tularemia causes the liver of affected animals to become speckled with numerous tiny areas of infection. Rabbits with tularemia are not safe to handle or to eat. (Photo courtesy of Michigan DNR)

When cleaning your rabbits, if you encounter one with numerous tiny white specks on the liver, or spleen, (see Figure 1) either bury it, or if it's convenient, put the entire animal in a plastic bag, thoroughly wash and disinfect your hands, and call the Wildlife Research Center in Columbia (314/449-3761). If you have reason to believe that you may have become infected through a cut, or other broken skin, consult your physician. Rabbits can have other conditions, far more common than tularemia, that can cause spotting or discoloration of the liver, and we'll discuss these in a moment, but the tiny white specks are characteristic of tularemia. Occasionally the specks are very numerous and the appearance of the liver is vaguely reminiscent of stars in the sky on a very clear night. When the infection has progressed to this stage, the liver and spleen will likely be swollen, as well. Remember, too, that the "fur, internal organs, body fluids, and discharges of an infected animal carry the bacteria which cause tularemia" (Fyvie and Addison, 1979), so handle all suspicious animals with care.

One final comment: during the 20+ years I've been engaged in rabbit research, and autopsied more than 12,000 rabbits, I have encountered tularemia in only two rabbits. This is quite remarkable when you consider that many of these animals were found dead and were being examined to determine the cause of death.

Bladderworms

These relatively harmless creatures probably account for more needless concern among rabbit hunters, and the discarding of more perfectly edible rabbits, than all other diseases and parasites, combined.

Hunters encounter bladderworms (*Cysticercus pisiformis*) during the cleaning process and frequently confuse these common internal parasites with tularemia. The confusion arises because bladderworms, like tularemia, can cause discoloration (spotting) of the liver.

Cottontails serve as the intermediate host for this parasite, and in some rabbit population virtually all animals carry at least a few. *Cysticercus* cysts in rabbits appear as nearly-clear and jelly-like roughly the size of garden peas (see Figures 2 and 3). They often cluster together, especially on or near the liver or in the rectal area. They may also be found singly adhering to any organ within the visceral cavity.

Figure 2. A moderately heavy infestation of bladderworm cysts. Note that some bladders aren't completely developed. Bladderworms are harmless to humans, although thorough cleaning is recommended. (Photo courtesy of Michigan DNR)

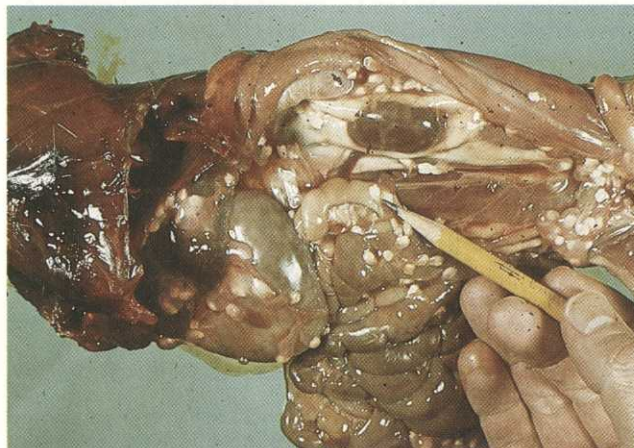


Figure 3. Bladderworms. (Photo by Nancy Lamb)



ty. The actual parasite is the small, slightly darker larvae usually visible within each fluid-filled bladder. As an "intermediate host", rabbits don't carry the adult form; dogs and cats do. Hence, the parasite remains in this subadult stage until it finds its way into the digestive system of any wild or domestic dog or cat. The exchange of one host for another occurs when the infected rabbit is eaten by the final host. The adult bladderworm is the dog/cat tapeworm.

After reaching maturity, the adult dog tapeworms (now called *Taenia pisiformis*) release "eggs", called proglotids, that pass from the dog's digestive system. Rabbits, hares, and rodents become infected by accidentally ingesting the eggs or segments during feeding. The eggs hatch and the tiny larvae begin development in the rabbit's digestive system. While still microscopic in size the larvae leave the gut, enter the blood stream and move to the liver. During their stay in the rabbit liver, the larvae increase considerably in size and after a month can be seen without magnification. During this brief period the larvae are quite mobile and move freely within the liver. As they migrate through the liver tissue they leave behind a trail of whitish, scar tissue. It's this scar tissue that is so often mistaken for the bacterial infections associated with tularemia. Discoloration of liver tissue by bladderworm larvae is usually in a band or streak. If the scar tissues appear as spots, they are usually few in number and surrounded by normal-appearing liver tissue. As we've mentioned, livers infected with tularemia show many tiny whitish specks and have a puffy, swollen appearance.

Aside from absorbing some nutrients from the host animal, even moderate infestations of either the larvae (in cottontails) or the adult tapeworm (in dogs or cats) don't necessarily cause illness if the host is otherwise healthy; on occasion they can cause severe discomfort and weight loss, however.

Bladderworm infestations can be extreme in some individual cottontails. In these rare cases, virtually all the organs and tissues of the body cavity are stuck together by bladderworm cysts. While hunters may wish to discard rabbits found with these heavy parasite loads, thorough cleaning and adequate cooking make even these rabbits suitable for human consumption.

One final word of caution: don't feed uncooked rabbit entrails to your dog or cat, or leave the entrails where other animals might find and eat them. This can only compound the tapeworm problem for your pet, or other wildlife, and the bladderworm problem for the rabbits.

Rabbit Tapeworms

In contrast to the dog/cat tapeworms, which remain in the bladderworm stage in cottontails, the rabbit tapeworm (*Cittotaenia variabilis*) reaches the adult stage in the rabbit's digestive tract. These flat, segmented tapeworms (Figure 4) can reach rather remarkable lengths, however, there's no evidence that they create serious problems for their host. During cleaning, hunters occasionally find these parasites free within the rabbit's body cavity. When this happens, it's because the tapeworm has escaped the gut via a shot puncture. Because this tapeworm can only survive within the rabbit's intestines, and do not invade muscle tissue, they create no problems for humans, or pets.



Figure 4. A portion of a rabbit tapeworm, *Cittotaenia*. These parasites are confined to the rabbit's intestines and go unnoticed by hunters unless the intestines are punctured. Harmless to humans. (Photo by Nancy Lamb.)

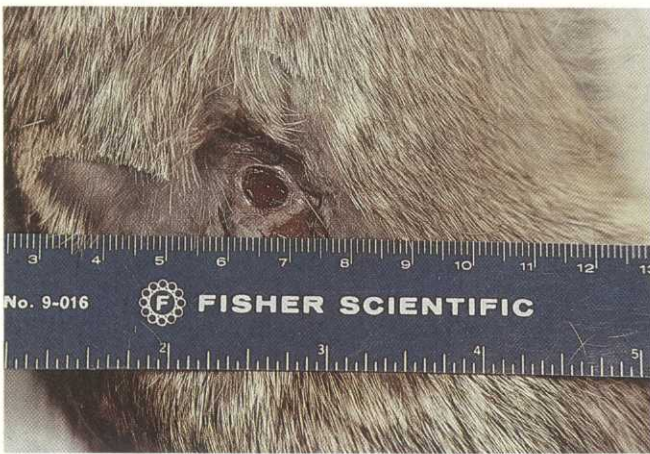
Warbles, Grubs, Bots, or "Wolves"

This parasite is known locally by a number of common names, however, they all refer to the same critter, *Cuterebra cuniculi*. The adult form is a large bot fly. It is the larva that uses the cottontail as a way-station on its way to adulthood.

As a rule, only early-season rabbit hunters encounter grubs. During mid- to late-October these parasites emerge from under the skin of the host rabbit (Figure 5) and drop to the ground to pupate. Rabbits in the southern half of Missouri seem to retain grubs later in the season than in the northern half, plus "southern" rabbits seem to be parasitized more frequently. Perhaps the frequency rate is influenced by the later retention in the southern parts of the state, and those that are present are encountered more often.

Figure 5. A large grub. (Photo by Ken Sadler.)





Figures 6 & 7. Grubs usually leave the rabbit during the fall and only early season hunters are apt to encounter them. The vacated pocket in the skin heals quickly and usually goes unnoticed later. Evidence of the grub is removed when the rabbit is skinned. (Photos by Ken Sadler and Nancy Lamb)

Although they are unpleasant looking beasts (Figure 6), most authorities don't consider grubs a serious parasite for rabbits, nor do they alter the edibility of the affected rabbit for human consumption. All, or nearly all, of the affected parts (Figure 7) are removed during skinning. If necessary, final trimming will make the rabbit completely edible.

Rabbit Fibromas

Missouri rabbit hunters, especially those in some localized areas in south Missouri, occasionally find rabbits with wart-like, unfurred tumors of the skin. The head region, including the nose, legs, ears and the feet are the usual sites of these fibrous tumors (Figures 8, 9 & 10), but they can occur elsewhere. These growths are caused by viruses which are transmitted by biting insects, especially mosquitos. Other species of wildlife can also be affected, particularly deer and squirrels.

Figures 8, 9 & 10. Rabbit fibromas, or "warts" can vary widely in size and shape. They are confined to the skin and removed during cleaning. They are harmless to humans. (Top photo courtesy of Michigan DNR. Bottom photos by Ken Sadler)

The illustration we've chosen is a especially robust form of this disease. Most animals are much less disfigured.

All of these virus-caused tumors are considered harmless to humans and because the growths are confined to the skin, and removed during skinning, they have no affect on the edibility of rabbit. In short, the "wart" growths may be somewhat unsightly but because they don't invade muscle tissue, thorough cleaning to remove the affected parts will make the remainder of the rabbit suitable for human consumption.

Sarcocystis

Missouri rabbit hunters occasionally report seeing whitish, thread-like streaks in the muscles of rabbits they've cleaned. The streaks are parallel to the muscle fibers and are most apt to be noticed after the rabbit has been sectioned into pieces. These whitish streaks are cysts of the genus *Sarcocystis*. This parasite can be found in a number of wild and domestic animals, including humans. Unfortunately, there is a great deal of uncertainty regarding the life cycles of *Sarcocystis*. There's general agreement that this parasite has a 2-host life cycle—an intermediate and a definitive (final) host. Humans are the final hosts for species that occur in cattle and in swine. The species that occurs in rabbits have cats as the final host. The rabbit/human "connection" has not been made.

Sarcocystis varies widely in size. In some animals the cysts are clearly visible to the unaided eye, in others they are microscopic. With careful scrutiny the cysts can be detected in rabbits, and they're quite obvious in ducks. Those in ducks are usually found in the breast muscles and look a good deal like grains of long, white rice.

Although there is no evidence that *Sarcocystis* in rabbits is a threat to humans, and the parasites are destroyed by cooking, hunters may wish to discard heavily infested rabbits for aesthetic, if not health, reasons.

Ticks and Fleas

A number of ectoparasites attach themselves to the rabbit's skin for varying periods of time. Some of them like humans, others don't. There are two species of ticks that hunters are most apt to find on rabbits—the rabbit tick (*Haemaphysalis leporis-palustris*) and the wood tick, or American dog tick, (*Dermacentor variabilis*). The rabbit tick is quite selective in its choice of hosts and rarely attaches itself to humans. This tick is believed to be one of the principal vectors of tularemia among rabbits. The wood tick is more cosmopolitan and will attach itself to most mammals, including humans. This species is considered to be the source of most identifiable cases of tularemia in humans. In a study of the relative abundance of these two species of ticks on rabbits in Illinois, Stannard and Pietsch, 1958, showed that the wood tick "...is a minor ectoparasite of rabbits". Comparable information in Missouri isn't available.

Blenden's study of reported cases of tularemia in humans in Missouri clearly shows a relationship between the sources of infection and seasons of the year. Tick-related cases were more frequent during the spring and summer

(peak month: June), and rabbit-related cases were more frequent during fall and winter (peak months: November and December).

The rabbit flea, (*Cediopsylla simplex*) may be found during all seasons, including winter, however during winter they are usually low in number and inconspicuous. As a rule, fleas are quite host-specific and the rabbit flea isn't considered an exception.

In summary, we hope this publication will assist hunters and others to identify the common diseases and parasites of rabbits. At first they may appear to be complex and confusing but by careful examination of the rabbit, and by referring to the text and illustrations, it should be possible to identify most of the abnormalities you're apt to encounter and help you decide how to deal with them.

If you have any question, please contact the Missouri Department of Conservation, Wildlife Research Section, 1110 College Avenue, Columbia, MO 65201 (314/449-3761), or your Conservation Agent.

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